

***Gelechia atlanticella* (Amsel, 1955) (Gelechiidae) newly recorded for the European fauna and a review of the *Gelechia* species feeding on Cupressaceae**

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Summary. *Gelechia atlanticella* (Amsel, 1955) is newly recorded for Europe (Spain). The adult of this hitherto poorly known species is redescribed. The male and, for the first time, the female genitalia structures are illustrated. Information on the habitat and host plant affiliation (Cupressaceae: *Juniperus thurifera* L.) is provided, and the significance of Cupressaceae as host plants of Gelechiidae is discussed in detail.

Zusammenfassung. *Gelechia atlanticella* (Amsel, 1955) wird erstmals aus Europa (Spanien) gemeldet. Die bisher kaum bekannte Art wird wiederbeschrieben, Falter sowie männliche und erstmals weibliche Genitalstrukturen werden abgebildet. Informationen zur Habitat- und Futterpflanzenwahl (Cupressaceae: *Juniperus thurifera*) werden gegeben und die Bedeutung der Cupressaceae als Substrat für Gelechiidae wird ausführlich diskutiert.

Résumé. *Gelechia atlanticella* (Amsel, 1955) est mentionné pour la première fois d'Europe (Espagne). L'adulte de cette espèce peu connue jusqu'à présent, est redécrit. Les armures génitales mâle et femelle sont illustrées, celles de cette dernière pour la première fois. Des informations sont présentées à propos de l'habitat et de l'affiliation trophique (Cupressaceae: *Juniperus thurifera* L.), et la signification des Cupressaceae en tant que plantes nourricières des Gelechiidae est discutée en détail.

Key words. Lepidoptera, Gelechiidae, *Gelechia atlanticella*, Europe, host plant, Cupressaceae, *Juniperus thurifera*.

Introduction

Although representing one of the most important families of Lepidoptera as far as species richness in Europe (Karsholt & Razowski 1996) is concerned, the fauna of Gelechiidae has received very little attention for almost 200 years of research on Lepidoptera. Generic revisions were almost completely lacking for long periods and species identifications could be achieved by only very few specialists. During the last few decades the situation has much improved and long-awaited identification guides to all species should be available in the foreseeable future (Huemer & Karsholt 1999). The taxonomy of a particularly problematic group, the genus *Gelechia*, has already been resolved by Sattler (1960). Currently, 20 European species are attributed to this genus (Huemer & Karsholt 1999), which is exceptionally well known with regard to data on distribution, taxonomy and biology. Therefore the record of a new species for the European fauna, *viz.* *Gelechia atlanticella*, came as a real surprise. Hitherto, this species was largely unknown, and therefore it is re-described here in some detail. Furthermore, biological information is included and is of particular interest because of the exceptional host plant, *Juniperus thurifera* L.

***Gelechia atlanticella* (Amsel, 1955)**

Nothris atlanticella Amsel, 1955: 59, text-fig. 4, pl. 6 fig. 3.

Gelechia atlanticella Sattler, 1960: 21, fig. 13.

Material examined. – 4 ♂, 2 ♀, Spain, Teruel, Puebla de Valverde, larvae 21.vi.1998, leg. J. Domingo; 1 ♂, e.l. 15.viii.1999, leg. J. Domingo (colls. ICBBE, Universitat de València, València; TLMF, Tiroler Landesmuseum Ferdinandeum, Innsbruck); 1 ♀, Spain, Teruel, Sarrión, larvae 30.vii.1998, leg. J. Domingo & M. Domínguez (TLMF).

Diagnosis. – Adult (Fig. 1). Wingspan 19–20 mm. Segment 2 of labial palpi with triangular brush of raised scales, basal half black, distal half off-white mottled with fuscous; segment 3 whitish grey mottled darker. Head whitish grey, thorax and tegulae whitish grey with numerous brown-tipped scales; antenna dark brown; ventral surface of abdomen pink to whitish grey with black lateral and sublateral lines. Forewing greyish brown mottled with whitish; short black streaks at base and in fold; broad median longitudinal streak interrupted by two whitish spots; termen with several black spots.

Similar species. *G. atlanticella* is practically indistinguishable from *G. sabinellus* externally, though the whitish mottling of the forewing is usually stronger, the black markings indistinct, and the sublateral lines of the ventrum are more distinct.

Male genitalia (Figs. 3–5). – Uncus broad, posterior margin strongly serrate; tegumen broad, about breadth of uncus; fultura superior with rounded flaps; valva slender and moderately long, extending to about base of uncus, distally rounded, with short tooth; sacculus very slender, falcate, almost reaching tip of valva; saccus moderately broad, with rounded tip; aedeagus stout, with curved apex.



Fig. 1. Adult ♂ of *Gelechia atlanticella*.



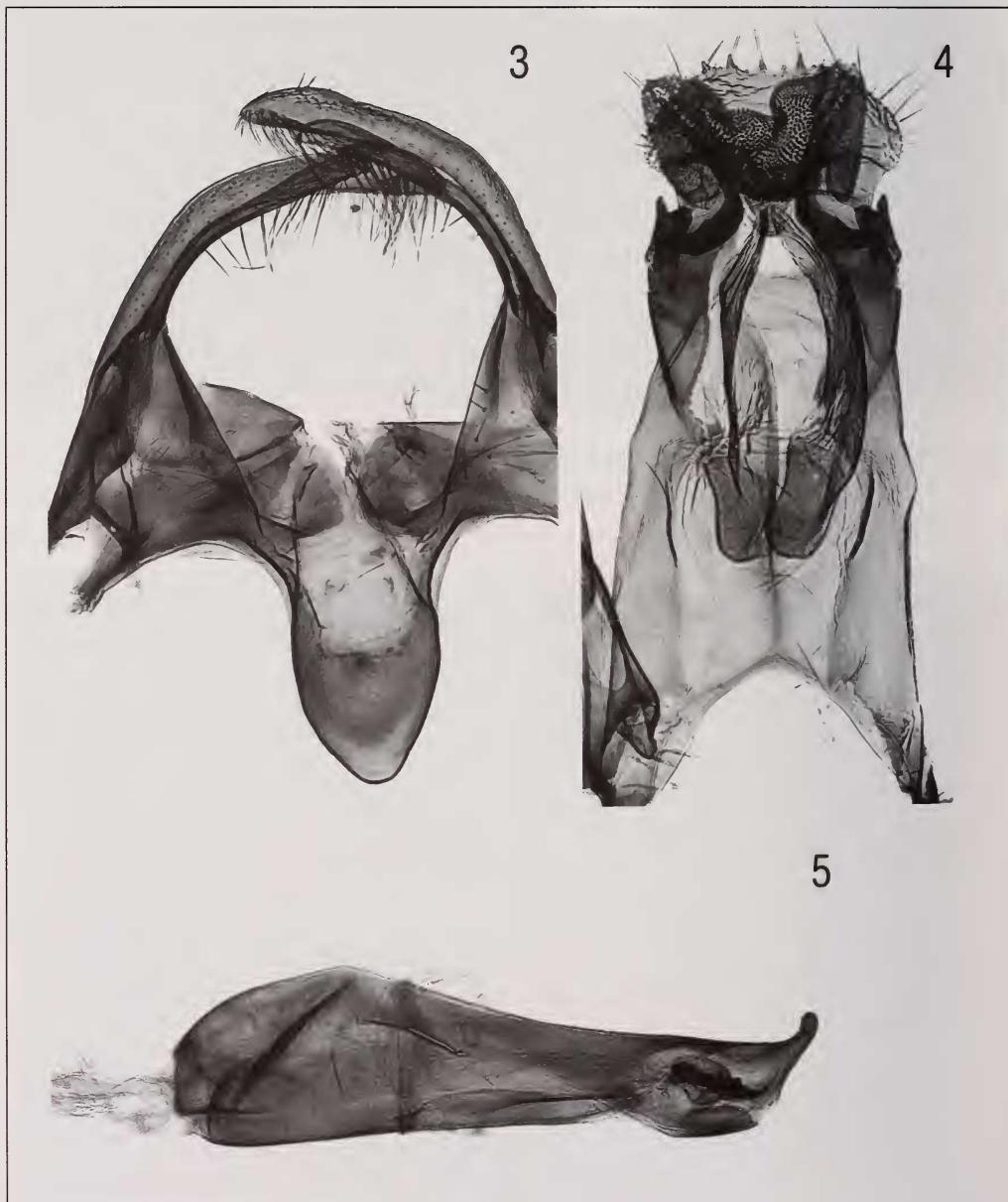
Fig. 2. Habitat of *Gelechia atlanticella* (Spain, Teruel).

Female genitalia (Figs. 6–7). – Segment 8 about 2.5 times longer than broad; ventromedial part with long, narrow zone of microtrichia; apophyses anteriores extremely short, close to subgenital plate; subgenital plate a pair of sub-oval lobes, caudally with subtriangular processes; ductus bursae coiled medially, corpus bursae elongated; signum large, sub-oval, with weakly serrate margin.

Distribution. – *G. atlanticella* is known only from a few isolated localities in Morocco (Ain Kahla) and Spain (Teruel: Puebla de Valverde, Sarrión). The distribution is closely associated with the larval host plant *Juniperus thurifera*, which is regarded as a Tertiary relict (Ozenda 1988; Suarez *et al.* 1992).

Bionomics. – The life-cycle and morphology of early stages are still insufficiently known. The larva is similar to those of other *Gelechia* feeding on Cupressaceae such as *G. senticetella* or *G. nervosella*. Body light green with head blackish brown, more slender than *G. senticetella* or *G. nervosella* and reaching 12–14 mm in the final stage. Its characteristic behaviour differs from the other *Gelechia* species found during this study. Larvae make nervous movements when collected, walking very quickly forward or backward when disturbed. However, a similar behaviour has been observed in many other gelechiids. The first larval stages are unknown but later stages feed on the leaves. Larvae were collected from *Juniperus thurifera* trees by using a beating tray and reared in the laboratory on leaves of the host plant. In the laboratory, pupation took place in a cocoon between the leaves. Collected larvae pupated within a few days, and adults emerged after approximately 30 days (indoors in València, Spain). The species is univoltine, at least in the Iberian mountains (Central Spain), as our annual survey

has shown. Adults emerged solely in July and August, indicating a single generation. **Habitat.** – *G. atlanticella* was found in the Spanish juniper forests of the Iberian mountains (Central Spain) (Fig. 2). *Juniperus thurifera* grows in forests where trees are represented only by this species and other Cupressaceae such as *J. phoenicea* and *J. communis*, mixed with some sclerophyllous *Quercus* (e.g. *Q. ilex* or *Q. faginea*), or as natural fences between crops. Some *Pinus* species such as *P. sylvestris* or *P. nigra*



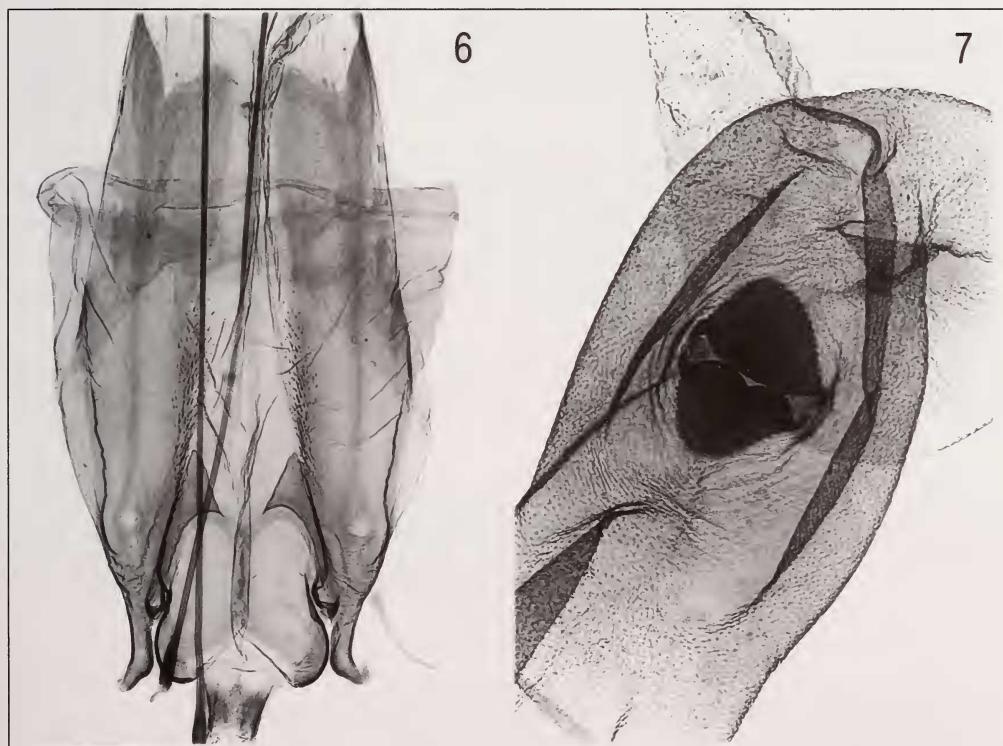
Figs 3–5. *Gelechia atlanticella* ♂ genitalia (slide GEL 967 P. Huemer): 3 – vinculum-valva complex; 4 – uncus-tegumen complex; 5 – aedeagus (same magnification).

subsp. *salzmanii* can grow in these habitats. This landscape shares with North Africa (where H. Powell found *G. atlanticella*) a remarkable number of North African floristic elements (Súarez *et al.* 1992). This flora is associated with a sizeable number of endemic or vicariant Lepidoptera exclusively found in this habitat on the Iberian Peninsula (Dominguez *et al.* 1997).

Remarks. – *Nothris atlanticella* was described from a single male bred from *Juniperus thurifera* by H. Powell (Amsel 1955) and was later placed in the genus *Gelechia* (Sattler, 1960). The female had remained unknown until now.

Discussion

G. atlanticella belongs to the *sabinellus* group of *Gelechia*, which has already been defined by Sattler (1960), based on host plant selection and morphological structures of the genitalia. This species-group also includes *Gelechia senticetella* (Staudinger, 1859), *G. sabinellus* (Zeller, 1839) (including the distinct subspecies *s. corsella* (Rebel, 1930)), *G. nervosella* (Zerny, 1927) and *G. allotria* Meyrick, 1925 (= *G. anarsiella* Chrétien, 1915, preocc.). Due to the courtesy of Dr. K. Sattler we have been able to examine a drawing of the female genitalia of a syntype of the latter. Accordingly, *G.*



Figs 6–7. *Gelechia atlanticella* ♀ genitalia (slide GEL 963 P. Huemer): 6 – segment 8; 7 – corpus bursae-signum (same magnification).

atlanticella is most closely related to *G. sabinellus* and *G. allotria*. These species share, in particular, the extremely reduced apophyses anteriores and sub-oval signum. Moreover, species of the *sabinellus* group are very similar externally and examination of the genitalia is recommended for their identification. The male genitalia of *G. atlanticella* are characterized by the shape of the uncus, valva and sacculus. The female genitalia differ from related taxa by, for example, the subtriangular processes of sternum 8.

Compared with other microlepidopteran families, gelechiids use an extreme diversity of plants with no strong preferences (Powell 1980; Powell *et al.* 1998). Even though many Gelechiidae genera are associated with particular host plant groups, for example *Ornativalva* Gozmány with *Tamarix*, *Caryocolum* Gregor & Povolný with Caryophyllaceae, *Mirificarma* Gozmány with Fabaceae, or *Metzneria* Zeller, *Isophrictis* Meyrick and *Apodia* Heinemann with Asteraceae (Sattler 1976; Pitkin 1984; Huemer 1988; Elsner *et al.* 1999), in the genus *Gelechia* a different trophical pattern is found (Sattler 1960). The division of species-groups within the genus is corroborated by host plant preferences, though precise relationships between host plants and *Gelechia* phylogeny remain unknown.

Among all the species-groups of the genus, only the *sabinellus* group is associated with Cupressaceae (the host-plant of *G. allotria* is unknown), while the remaining species-groups within *Gelechia* show a clear preference for other families such as Salicaceae, Rosaceae, Elaeagnaceae and Aceraceae (Sattler 1960; Huemer & Karsholt 1999). Host-plants of some species such as *G. dujardini* Huemer 1991, *G. mediterranea* Huemer, 1991 and *G. aspoecki* Huemer, 1992 are unknown, but it seems likely that they could be associated with Aceraceae and Salicaceae (Huemer 1991, 1992).

Tab. 1. Distribution and host plants of the *Gelechia sabinellus* species-group.

Species	Distribution	Host-plants	References
<i>Gelechia atlanticella</i>	Only known from two isolated areas: Ain Kahla (Morocco) and Puebla de Valverde (Spain)	<i>Juniperus thurifera</i>	Amsel (1955)
<i>Gelechia nervosella</i>	France, Spain and	<i>J. thurifera</i>	Cleu (1928); Huemer & Karsholt (1999)
<i>Gelechia allotria</i>	Morocco Only known from Frenda, Oran (Algeria)	Unknown	Chrétien (1915)
<i>Gelechia senticetella</i>	Western Palaearctic (excluding northern Europe). Recently spread to various countries.	<i>J. thurifera</i> , <i>J. sabina</i> , <i>J. oxycedrus</i> , <i>J. communis</i> , <i>J. phoenicea</i> , <i>Thuja</i> sp.	Cleu (1928); Lhomme (1935–1949); Gómez de Aizpúrrua (1995); Huemer & Karsholt (1999); Blasco Zumeta (2000); Domingo <i>et al.</i> (2000)
<i>Gelechia sabinellus</i>	Western Palaearctic	<i>J. thurifera</i> (?) <i>J. communis</i> , <i>J. sabina</i> , cultivated Cupressaceae	Lhomme (1935–1949); Emmet (1979); Huemer & Karsholt (1999); Elsner <i>et al.</i> (1999)

Cupressaceae are also larval host plants of other unrelated European gelechiids, *viz.* *Chionodes electella* (Zeller, 1839), *Dichomeris juniperella* (Linnaeus, 1761) and *D. marginella* (Fabricius, 1781). Nevertheless, within the Microlepidoptera, only Argyresthiinae (Yponomeutidae) seem to have developed appreciable speciation on Cupressaceae (Powell 1980; Powell *et al.* 1998).

Previous studies on *Juniperus* and its associated Lepidoptera have been done in Spain, France and Morocco (Cleu 1928; Wiltshire 1976; Lainé 1983; Roques *et al.* 1984; Gómez de Aizpúrua 1990, 1995; Blasco-Zumeta 2000; Domingo *et al.* 2000). Consequently, there is good knowledge about the distribution and host-plants of the Lepidoptera species associated with this gymnosperm family. Surprisingly, previous surveys have ignored the complex of *Gelechia* species (Wiltshire 1976; Lainé 1983). Only Cleu (1928), Gómez de Aizpúrua (1990, 1995) and Blasco-Zumeta (2000) have included at least one of these species. In our Spanish juniper study, three species of the *sabinellus* group have been found (*G. atlanticella*, *G. senticetella* and *G. nervosella*) showing a trophic succession. The larvae of *G. nervosella* have been found during the winter months (adults emerged in late winter and early spring in the laboratory), *G. senticetella* during early spring (adults emerged in mid spring) and, finally, *G. atlanticella* in late June and July (adults emerged in July and August). Externally, these gelechiid species share a similar wing pattern (when resting on juniper bark, the forewings – grey with dark lines – are cryptic), which also occurs in some other Lepidoptera species of different families feeding on the leaves of Cupressaceae, such as *Afriberina tenetaria* (Staudinger, 1900) (Geometridae), *Menophra harterti* (Rothschild, 1912) (Geometridae), *Ecleora solieraria* (Rambur, 1834) (Geometridae), *Pachypasa limosa* (Serres, 1827) (Lasiocampidae) and *Lithophane leautieri* (Boisduval, 1829) (Noctuidae).

Individual species of the *sabinellus* group are restricted to one or a few *Juniperus* species. This kind of monophagy has been found in other gelechiids (Pitkin 1988) and is closely related to the distribution area of each species (see Table 1). In fact, the inability to utilize a wider range of species within *Juniperus* has restricted the distribution of the species of *Gelechia*. Monophagous specialists on *Juniperus thurifera* such as *G. atlanticella* and *G. nervosella* are therefore local endemics. Though species of the *sabinellus* group use a limited number of host species in nature, most *Juniperus* species are acceptable to them in culture, even introduced Cupressaceae that do not occur in their natural habitat.

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References

Amsel, H. G. 1955. Über mediterrane Microlepidopteren und einige transcaspische Arten. – Bull. Inst. r. Sci. nat. Belg. 31 (83): 1–64.

Blasco-Zumeta, J. 2000. Contribution à l'étude de la faune associée à *Juniperus thurifera* L. dans Los Monegros (Aragon, Espagne). Pp. 94–104 in: Gauquelin, T., Asmodé, J. F. & Largier, G. (eds.), Le Genévrier thurifère (*Juniperus thurifera* L.) dans la Méditerranée. – Dossiers Forestiers, 6. Paris. 291 pp.

Chrétien, P. 1915. Contribution a la connaissance des Lépidoptères du Nord de l'Afrique. – Annls. Soc. Ent. Fr. **84**: 289–356.

Cleu, H. 1928. Les lépidoptères parasites du *Juniperus thurifera* L. dans les Hautes Alpes. – Amateur Papillons **4**: 87–93.

Domingo, J., Domínguez, M. & Baixeras, J. 2000. Le Genévrier thurifère (*Juniperus thurifera* L.) et sa faune associée (Insecta, Lepidoptera). Pp. 104–115. – In: Gauquelin, T., Asmodé, J. F. & Largier, G. (eds.), Le Genévrier thurifère (*Juniperus thurifera* L.) dans la Méditerranée. – Dossiers Forestiers, 6. Paris. 291 pp.

Domínguez, M., Domingo, J. & Baixeras, J. 1997. Origen y evolución de los lepidópteros de las estepas ibéricas. – In: Anento, J. L.; Selva, J. & Jiménez, R. Las Saladas de Alcañiz (eds.), Estudio interdisciplinar. – Consejo de Protección de la Naturaleza de Aragón, Zaragoza. 159 pp.

Elsner, G., Huemer, P. & Tokár, Z. 1999. Die Palpenmotten (Lepidoptera, Gelechiidae) Mitteleuropas. – F. Slamka, Bratislava. 208 pp.

Emmet, A. M. (ed.) 1979. A field guide to the smaller British Lepidoptera. – British Entomological and Natural History Society, London. 271 pp.

Gómez de Aizpúrua, C. 1990. Biología y morfología de las orugas. Lepidoptera. Tomo VIII. – Ministerio de Agricultura, Pesca y Alimentación, Madrid. 220 pp.

Gómez de Aizpúrua, C. 1995. Fauna lepidopterológica de los principales árboles del género *Juniperus*, representados por las especies *communis* L., ssp. *nana* (Willd.), *oxycedrus* L., *thurifera* L., y *sabina* L., de la familia Cupressaceae. – Bol. San. Veg. Plagas **21** (4): 527–539.

Huemer, P. 1988. A taxonomic revision of *Caryocolum* (Lepidoptera: Gelechiidae). – Bull. Br. Mus. nat. Hist. (Ent.) **57**: 439–571.

Huemer, P. 1991. *Gelechia sestertiella* auct., ein Artenkomplex (Lepidoptera: Gelechiidae). – Nota lepid. **14**: 115–130.

Huemer, P. 1992. *Gelechia aspoecki* sp. n. aus Südfrankreich. – Alexanor **17**: 391–394.

Huemer, P. & O. Karsholt, 1999. Gelechiidae I (Gelechiinae: Teleiodini, Gelechiini). – In: Huemer, P., Karsholt, O. & Lyneborg, L. (eds), Microlepidoptera of Europe 3. Apollo Books, Stenstrup. 356 pp.

Karsholt, O. & Razowski, J. (eds.) 1996. The Lepidoptera of Europe. A distributional checklist. – Apollo Books, Stenstrup. 380 pp.

Lainé, M. 1983. Lépidoptères de la biocénose du Genévrier et du Cyprès en Normandie. Complément à l'étude de E. P. Wiltshire. – Alexanor **13**: 138–139.

Lhomme, L. 1935–1949. Catalogue des lépidoptères de France et Belgique. Volume II. Microlépidoptères. – Le Carriol par Douelle, Lot. 1253 pp.

Ozenda, P. 1988. Die Vegetation der Alpen im europäischen Gebirgsraum. – Gustav Fischer Verlag, Stuttgart, New York. 353 pp.

Pitkin, L. M. 1984. Gelechiid moths of the genus *Mirificarma*. – Bull. Br. Mus. nat. Hist. (Ent.) **48**: 1–70.

Pitkin, L. M. 1988. The Holarctic genus *Teleiopsis*: host-plants, biogeography and cladistics (Lepidoptera: Gelechiidae). – Ent. scand. **19**: 143–191.

Powell, J. A. 1980. Evolution of larval food preferences in Microlepidoptera. – Annu. Rev. Entomol. **25**: 133–159.

Powell, J. A., Mitter, C. & Farrell, B. 1998. Evolution of larval food preferences in Lepidoptera. Pp. 403–422. – In: Kristensen, N. P. (ed.), Handbook of Zoology 4, Arthropoda: Insecta. Part 35. Lepidoptera, moths and butterflies 1: Evolution, systematics and biogeography. – W. de Gruyter, Berlin.

Roques, A., Raimbault, J.P. & Goussard, F. 1984. La colonisation de cônes et galbules des genévriers méditerranéens par les insectes et acariens et son influence sur les possibilités de régénération naturelle de ces essences. – Ecologia Mediterranea **10** (1–2): 147–169.

Sattler, K. 1960. Generische Gruppierung der europäischen Arten der Sammelgattung *Gelechia* (Lepidoptera, Gelechiidae). – Dt. ent. Z. (N. F.) **7**: 10–118.

Sattler, K. 1976. A taxonomic revision of the genus *Ornativalva* Gozmány, 1955 (Lepidoptera: Gelechiidae). – Bull. Br. Mus. nat. Hist. (Ent.) **34**: 87–152.

Suárez, F., Sainz, H., Santos, T. & González, F. 1992. Las estepas ibéricas. – Ministerio de Obras Públicas y Transporte, Madrid. 160 pp.

Wiltshire, E. P. 1976. La répartition en Bretagne et en Normandie des Lépidoptères de la biocénose du genévrier et du cyprès. – Alexanor **9**: 341–360.